Section 4
LOADING AND STARTING THE FIRMWARE RESIDENT UTILITIES

4.1 Overview

This section provides the procedures for loading the Firmware Resident Utilities (FRU) into the host system's memory and invoking these utilities from the host console or from a terminal connected directly to the QFS10.

The QFS10 uses a 512 byte Nonvolatile Random Access Memory (NOVRAM) to store subsystem configuration information. This information is used by the QFS10 to determine device types, device addresses, device configurations, and to enable or disable various user-programmable options. Diagnostic programs embedded in the firmware of the QFS10 (FRU) provide access to the NOVRAM.

4.2 FRU Overview

FRU is an interactive, menu-driven utility program that allows the user to communicate with the QFS10 via the host CPU console device, onboard RS-232 port, or through the online FRU application. The FRU includes the utilities for loading the NOVRAM with configuration data, formatting and surface, verifying the disk or tape media, and initializing RCT areas on both the magnetic and optical media.

FRU also can be used to perform reliability testing of the subsystem. While not designed to isolate problems at the component level, these reliability tests can aid in isolating a problem on either the SCSI side or the host side of the system.

In addition, FRU provides a tape performance monitor that gives the user information such as how much tape has been used, how much tape remains, error rate, and compression ratios.

FRU can be accessed in both offline and online modes. In the offline mode, a special code module is uploaded to the host to establish a logical connection between the host console terminal and the QFS10 FRU. Offline mode may be used only while the host system is halted.

For online operation, the QFS10 provides two methods to communicate with its on–board utilities. First, through an onboard RS-232 port and second, through an application program provided by Emulex that runs under the appropriate operating system.

The QFS10 provides a very convenient method of communicating to its onboard utilities through a logical connection to any terminal attached to the online host. Emulex supplies a special application program that can run under various operating systems. This application, when run, establishes a logical connection from the terminal that invokes the application through the DEC MSCP driver to the FRU on the QFS10.

Both methods of online operation allow the user to run normal online disk or tape operations while running format/verify/exercise utilities offline.

The following subsections describe how to start FRU depending on the type of connection (online/offline) and which computer and operating system is being used.

The following keyboard conventions are used when running the FRU:

<CR>	Carriage return key required to terminate operator inputs.
<LF>	Line feed key used to close a memory location and open the next.
<Ctrl-C>	Aborts the current operation and returns to the main menu.

A minimum delay of 10 seconds might occur between the <Ctrl-C> and the next display. During some verify operations, the delay might be considerably longer because the abort is delayed until the successful completion of the current command.

4.3.3 Starting FRU on an LSI-11 Host System

Use the following procedure to start FRU on LSI-11 host systems. If the NOVRAM contains the wrong base address, use the procedure described in subsection 4.3.4.

To start FRU on an LSI-11 system, first set SW1–3 to ON to select the LSI-11 host system, then halt the processor. Next enter the following commands in response to the ODT prompt (@):

```
@177xxxxx/000000 1 <CR>
@177yyyyy/005400 30003 <CR>
@/000400 42000 <CR>
@177yyyyy/002000 <CR>        Test for 2000
@R7/200                      Load PC
@P                           Proceed
```

NOTE: Be sure that you are using addresses that are not in conflict with other devices already installed in your host system.

Table 4–3. LSI Offsets for MSCP Emulation

QFS10 Bus Address (Octal)	XXXX (Octal)	YYYY (Octal)
17772150	72150	72152
17760334	60334	60336
17760340	60340	60342
17760344	60344	60346
17760350	60350	60352
17760354	60354	60356
17760360	60360	60362
17760364	60364	60366
17760370	60370	60372
17760374	60374	60376
17760400	60400	60402
17760404	60404	60406
17760410	60410	60412
17760414	60414	60416
17760420	60420	60422

Table 4–4. LSI-11 Offsets for TMSCP Emulation

QFS10 Bus Address (Octal)	XXXX (Octal)	YYYY (Octal)
17774500	74500	74502
17760404	60404	60406
17760410	60410	60412
17760414	60414	60416
17760444	60444	60446
17760450	60450	60452
17760454	60454	60456
17760504	60504	60506
17760510	60510	60512
17760514	60514	60516
17760520	60520	60522
17760524	60524	60526
17760530	60530	60532
17760534	60534	60536
17760540	60540	60542
17760544	60544	60546

When the appropriate starting procedure is completed, FRU identifies itself by displaying the main menu.

4.3.4 Starting FRU With a NOVRAM Base Address Conflicts (LSI-11)

If the host system contains another adapter at base I/O address 772150_8 and the QFS10 is configured for that address, the system will not recognize the QFS10.

To start FRU with an incorrect base address on the LSI-11 system:

1. Press BREAK on the system console to halt the computer.
2. Set SW1–2 to ON to enable uploading the LSI-11 driver to system memory.
3. Set SW1–3 to ON to select the LSI-11 host system.
4. Toggle SW1–1 to reset the QFS10 and upload the driver.
5. Wait until only LED1 is lit.
6. Enter the following commands on the host console:

```
@R7/xxxxxx 200 <CR>         load PC
@P                          start FRU
```

7. When you are finished configuring the NOVRAM, return SW1–2 to the OFF position before exiting FRU.

4.3.5 Terminating FRU Offline

To terminate FRU, choose one of the following:

- Press the BREAK key
- Re-initialize the system *or*
- Halt the CPU

4.4 Starting the FRU in Online Mode

For online operation, the QFS10 provides two methods to communicate with its onboard utilities; the local RS-232 port and the online FRU application program.

NOTE: When modifying NOVRAM parameters in online mode, the changes will not take place until the controller is initiated (system rebooted). This protects the operating system from crashing if, for example, the bus addresses are changed in the QFS10.

If the user wishes to format/test a disk or tape, it must first be dismounted by the operating system.

CAUTION! Once the device is dismounted, the QFS10 utilities are capable of destroying any data contained on the device selected for test. The QFS10 utilities prompt the user with a warning message before any destructive operations take place.

4.4.1 Using the QFS10 Local RS-232 Port

In order to communicate through the locally attached RS-232 port on the QFS10, the host adapter must be in a normal running state. This is accomplished through the initialization sequence that occurs when the system boots. The heartbeat LED (LED4) blinks to indicate the QFS10 is performing its scheduling task. A VT100 compatible terminal may be connected to J2 using an Emulex CRT cable. This cable, shown in Figure 4–1, is available from Emulex.

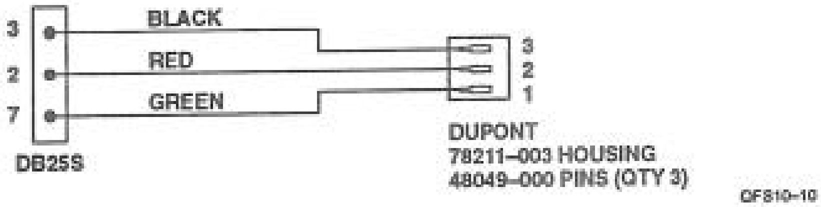

Figure 4–1. Local RS-232 Cable Connection

The terminal must be set to 9600 Baud, 8 bits, 1 stop bit, and no parity.

Once the terminal is connected and the controller is running, FRU is invoked by pressing `<Return>`. This will cause the FRU main menu to appear.

NOTE: If FRU is already running through the online applications mode the message `FRU Busy` will appear instead of the main menu. This occurs because FRU can only support one logical connection at a time.

4.3 Starting the FRU in Offline Mode

The FRU is normally run from the host CPU console in offline mode when the host's operating system is not running. A special command sequence is issued via console ODT to the FRU. The procedure for starting the FRU depends on the host CPU type and whether or not the NOVRAM contains an I/O base address that conflicts with another adapter in the system.

When the appropriate starting procedure is completed, FRU identifies itself by displaying the main menu.

4.3.1 Starting the FRU on MicroVAX Host Systems

The following procedure should be used to start the FRU on MicroVAX host systems. If the NOVRAM contains the wrong base address, use the procedure described in subsection 4.3.2.

To start the FRU on a MicroVAX host system:

1. Apply power to the system.
2. Put the system in console mode.
3. Enter the following commands from the host console in response to the system prompt `(>>>)`:

```
>>>U <CR>                             Unjam or reset bus
>>>I <CR>                             Initialize the CPU
>>>D/P/W 20001F40 20 <CR>             Enable memory
>>>D/P/L 20088000 80000000 <CR>       Set up map 0
>>>D/P/L 20088004 80000001 <CR>       Set up map 1
>>>D SP 200 <CR>                      Initialize stack pointer
>>>D/P/W 2000XXXX 1 <CR>              Initialize QFS10
>>>E/P/W 2000YYYY                     Should return value of AB0
>>>D/P/W 2000YYYY 3003 <CR>           Enable special mode
>>>E/P/W 2000YYYY                     Should return value of 100
>>>D/P/W 2000YYYY 4401 <CR>           Upload driver
>>>E/P/W 2000YYYY                     Should return value of 400
>>>S 80 <CR>                          Start driver
```

For a console terminal that is a workstation with a GPX monitor, enter the last command as:

```
>>>S 82<CR>                           Start driver
```

The *XXXX* and *YYYY* variables are offsets dependent on the base I/O address of the host adapter. For the MicroVAX, the offsets are a hexadecimal (*XXXX*=number, *YYYY*=number+2) expression of the last five digits of the I/O address (which is octal).

NOTE: Be sure that you are using addresses that are not in conflict with other devices already installed in your host system.

Tables 4–1 and 4–2 give the standard QFS10 controller addresses for disk and tape devices, respectively. The FRU will allow you to select any address that is typed in for the host adapter.

This includes any of the CSRs that the QFS10 is configured to respond to; disk, tape, the changer, or the utility CSR.

For more information on selecting a Q-bus address, refer to your DEC operating system and MicroVAX system documentation.

Table 4–1. MicroVAX Offsets for MSCP Emulation

Bus Address (octal)	**XXXX (hexadecimal)**	**YYYY (hexadecimal)**
17772150	1468	146A
17760334	00DC	00DE
17760340	00E0	OOE2
17760344	00E4	00E6
17760350	00E8	00EA
17760354	00EC	00EE
17760360	00F0	00F2
17760364	00F4	00F6
17760370	00F8	00FA
17760374	00FC	00FE
17760400	0100	0102
17760404	0104	0106
17760410	0108	010A
17760414	010C	010E
17760420	0110	0112

Table 4–2. MicroVAX Offsets for TMSCP Emulation

Bus Address (octal)	XXXX (hexadecimal)	YYYY (hexadecimal)
17774500	1940	1942
17760404	0104	0106
17760410	0108	010A
17760414	010C	010E
17760444	0124	0126
17760450	0128	012A
17760454	012C	012E
17760504	0144	0146
17760510	0148	014A
17760514	014C	014E
17760520	0150	0152
17760524	0154	0156
17760530	0158	015A
17760534	015C	015E
17760540	0160	0162
17760544	0164	0166

4.3.2 Starting FRU with a NOVRAM Base CSR Address Conflict (MicroVAX–VAX)

If the host system contains another adapter at base I/O address 772150_8 and the QFS10 is configured for that address, the system will not recognize the QFS10.

To start FRU with an incorrect base address on VAX or MicroVAX systems:

1. Press break on the host console to stop the system.
2. Enter the following commands from the base console:

```
>>>U <CR>                              initialize bus
>>>I <CR>                              initialize CPU
>>>D SP 200 <CR>                       load stack pointer
>>>D/P/W 20001F40 20 <CR>              enable memory
>>>D/P/L 20088000 80000000 <CR>        set map 0
>>>D/P/L 20088004 80000001 <CR>        set map 1
```

3. Set SW1–2 to ON to enable uploading the VAX driver to system memory.
4. Set SW1–3 to OFF (default setting) to select a MicroVAX host system.
5. Toggle SW-1 to reset the QFS10 and upload driver to VAX memory.
6. Wait until only LED1 is lit.
7. Start the FRU using the appropriate command:
    a. From a standard console terminal enter `>>>S 80 <CR>`
    b. If the console terminal is a GPX monitor, enter `>>>S 82 <CR>`
8. When you finish configuring the NOVRAM, return SW1–2 to the OFF position before exiting the FRU.

4.4.2 Running FRU through Online Application

Depending on the operating system, Emulex supplies an application program that resides on the host system and can be run from any terminal. At the system prompt type the appropriate command to run the application FRU. The main menu will appear on the terminal through which the application was started.

Because the utilities contained with the FRU could erase the contents of a magnetic tape or disk connected to the QFS10, system managers should protect this program from unauthorized users.

NOTE: If FRU is already running through the local RS-232 port on the QFS10, the application program will wait for the RS-232 port FRU to exit.

Before running the FRU, the utility address and number must be set using the configuration menu.

4.4.3 Terminating Online FRU

To exit FRU from either online mode, return to the main menu and select "Exit FRU", then press `<Return>`.

Section 5
FIRMWARE RESIDENT UTILITIES OPERATION

5.1 Overview

The QFS10 Firmware Resident Utilities (FRU) are a set of powerful, user-friendly utilities for configuring the QFS10 and the SCSI peripherals attached to it. An autoconfigure mode allows the user to simply connect the SCSI devices and initialize them. The FRU also includes a number of powerful tools for you to format, erase, verify and alter the characteristics of the peripherals attached to the QFS10.

5.1.1 Conventions Used

The following conventions are used for entering data and selecting options from the menus:

- Tasks that destroy user data display the following caution:

  ```
  *** USER DATA WILL BE DESTROYED! ***
  Do you wish to continue? [Y/N (N)]
  ```

- The menus use square brackets to indicate a range of options, and parentheses to indicate the default option. For example, the following prompt shows that the range of accepted responses is 1 through 3, and the default is 3:

  ```
  Enter an option number [1-3 (3)]
  ```

- Some utilities prompt you to select disk or tape units. When there is only one device, it is automatically selected and displayed for you, as shown in the example below:

  ```
  Devices selected:
      Tape Unit 0
  ```

  If there are multiple units configured for the subsystem, the utility displays all the units and allows you to make individual selections. The following prompt is displayed:

  ```
  Select one or more device numbers and type <Return> only to
  continue

  Enter device number: [1-7]
  ```

  Make a selection by entering the device number and pressing <CR>.

  To start the utility and exit the device selection prompt, press <CR> without entering a device number.

5.1.2 General Information

Press `<Ctrl-C>` at any time to abort the current operation and return to the main menu. A SCSI format can only be aborted with a SCSI bus reset.

CAUTION! Resetting the SCSI bus during a disk format operation will corrupt the disk, requiring another format command to be issued to the drive. If tape operations are taking place, there is a possibility of data corruption on the tape.

During any disk verify/read operations, if a defective block is encountered the QFS10 will issue a replace block command to the drive. This occurs whether or not host initiated bad block replacement is enabled.

A format command will always use the manufacturers (primary) defect list or it will optionally replace blocks using the grown defect list.

Multiple tape or disk drives may be selected for any operation when multiple drives exist. A special menu prompt will ask which drives to select for an operation. If only one drive is present, it is automatically selected.

When you first run the FRU you are prompted for the terminal type as follows:

```
Is terminal VT100 compatible [Y/N (Y)]?
```

If your terminal does not support graphics, enter N and a numbered menu of options will display. To select an option, enter its number.

NOTE: GPX terminals power up in non-VT100 compatible mode.

5.1.3 The FRU Main Menu

Once the FRU has started the main menu appears:

```
QFS10 Firmware Resident Utilities

    Main Menu

    Configuration Utility

    Disk Utilities

    Tape Utilities

    Interactive SCSI Exerciser

    Exit FRU

Up/Down arrow keys to move cursor
<Return> to select option
```

The following subsections define each of the options available, their functions, and the situations to which they apply. These options are presented in the order in which they are most commonly used.

Use the up/down arrow keys to highlight the desired option. Press carriage return <CR> to make the selection.

5.2 Configuration Utility

The QFS10 configuration menu allows the user to alter the basic characteristics of the host adapter. These characteristics are stored in NOVRAM. After selecting the configuration utility the following sub menu appears. The content of the menu represents the currently stored NOVRAM parameters. The default parameters are shown below.

```
QFS10 Configuration: PROM Rev: Xnn  Cache: 512KB
Disk controller address:        172150
Tape controller address:        0
Changer device address:         0
Utility server address:         0
Disk base unit number:          0
Tape base unit number:          0
Changer device unit number:     255
Utility server unit number:     255
Enable Q-bus adaptive DMA:      YES
Q-bus DMA burst length:         8
Q-bus DMA burst delay:          2
Enable LSI-11 auto boot:        NO
Auto boot controller address:   172150
Auto boot unit number:          0
Enable disk data caching:       YES
Minimum read ahead block cnt:   2
Maximum read ahead block cnt:   16
Enable host initiated replace:  NO

Do you wish to change any parameters? [Y/N (N)] Y
```

If you do not want to alter the NOVRAM settings, exit this menu by pressing <CR>. If you want to modify any of the parameters, enter Y and press <CR> and you will be prompted to change each parameter.

5.2.1 QFS10 Configuration

For each of the following parameters, enter the desired value or press <CR> to accept the default value.

5.2.1.1 CSR Addresses

When you change parameters the FRU displays a list of suggested CSR addresses for disk and tape devices. The first prompt asks you to specify the CSR for the disk (MSCP) server. Enter the desired CSR. The valid range is shown in brackets with the current value shown in parentheses.

In the following example, the primary disk address is being changed:

```
Disk CSR addresses:   172150 160334 160340 160344 160350
Tape CSR addresses:   174500 160404 160410 160414 160444
Use next available disk CSR for changer device and utility
server
```

```
Disk controller address: [0-177777 (160334)] 172150 <CR>
```

The next three prompts ask for the tape (TMSCP) server address, changer or robot, and utility server.

The changer address defines the CSR for a robotic device used in disk or tape jukeboxes. Use the next unused disk address.

The utility server defines the CSR through which the online FRU application program communicates with the QFS10 FRU. This address must be the next unused disk address.

5.2.1.2 Disk Base Unit Number

This number is the MSCP base unit number:

```
Disk base unit number: [0-255 (0)]
```

If you want the disk device attached to the QFS10 to respond as DUx 0, then enter 0 in this field. If you want the first disk to respond as DUx 3, then enter 3 in this field. After the base unit is set, other SCSI disks attached to the QFS10 will respond in sequence (according to their SCSI address or LUN) as DUx 4 DUx 5 DUx 6 etc. The default value for this field is 0.

5.2.1.3 Tape Base Unit Number

This number is the TMSCP base unit number.

```
Tape base unit number:  [0-255 (0)]
```

The same rules apply to this as the disk base unit number except the VMS device number is MUx 0 MUx 1 MUx 2 etc. The default is 0.

5.2.1.4 Changer Device Unit Number

This number is the changer MSCP base unit number. Since the changer will typically be assigned a unique CSR, this number can overlap the disk or tape unit numbers. The default value for this field is 255.

```
Changer device unit number:  [0-255(255)]
```

If more than one changer is present, use a lower starting base number as necessary. By keeping this unit number above 200 (for example, DUC255), the computer operator is less apt to confuse the changer for a disk device.

5.2.1.5 Utility Server Unit Number

This is the unit number that the internal FRU firmware will respond to. The default is 255. No matter what value is used in this field, the FRU application running on the host will prompt for the unit number assigned to the QFS10.

```
Utility server unit number:  [0-255(255)]
```

5.2.1.6 Adaptive DMA

Adaptive DMA (Direct Memory Access) allows devices other than the QFS10 access to the Q-bus in a timely fashion and prevents them from being locked out of DMA activity by long disk data transfers.

If adaptive DMA is enabled (default), the host adapter monitors the Q-bus for the presence of a DMA Request (DMR) signal, indicating another device is requesting bus mastership. The host adapter then terminates DMA during the current DMA burst (after one or two additional word-length DMA cycles) and waits for the length of time specified by the burst delay parameter.

If adaptive DMA is disabled, the host adapter does not monitor the Q-bus, and other devices may access the Q-bus only between DMA bursts. This might be desirable in a system where there is a lot of interactive terminal activity that would interrupt DMA transfers from the host adapter frequently. To enable this feature, enter `Y` at the following prompt:

```
Enable Q-bus adaptive DMA: [Y/N (Y)]
```

When adaptive DMA is enabled, other DMA devices may prevent the host adapter from accessing the bus. The DMA threshold and burst delay should be set differently for adaptive DMA enabled versus disabled.

5.2.1.7 DMA Burst Length

The DMA burst length specifies how many words into a DMA burst the host adapter will wait before checking to see if another device on the Q-bus has set DMR. The valid range is 1 to 8. The higher you set this value, the less often the QFS10 will relinquish bus mastership to other devices. In MicroVAX systems, this parameter is important because the CPU sets DMR whenever it wants to service Q-bus interrupt. The default value is 8.

At the following prompt, enter the number of words to transfer within DMA burst before checking for DMR:

```
Q-bus DMA burst length: [1-8 (8)]
```

In MicroVAX systems with a large number of interactive terminal users, the frequency of Q-bus interrupts can be quite high. In this type of application, setting the DMA threshold too low, increases the length of time it takes for disk applications to complete. If you set the DMA threshold too high, it might affect the apparent user terminal response time. We recommend setting this value to 8, then decreasing it only if terminal response or data late problems occur on other devices.

5.2.1.8 DMA Burst Delay

The burst delay specifies the time interval (microseconds) that the host adapter waits to issue a DMR between DMA bursts. The valid range is 2 through 16, in multiples of 2 with a default value of 2:

```
Q-bus DMA burst delay: [2-16 (2)]
```

Keep in mind that the lower you set this value, the less opportunity other devices will have to get their DMA requests honored. This is particularly true if the host adapter is on the front of the bus. If you have a lightly-loaded system with a limited number of users and disk speed is the important consideration, set this value to the minimum (2). If you add interactive users and devices to the system, you may increase the value of this parameter to balance disk throughput, terminal response, and DMA needs of other devices on the bus.

5.2.1.9 Enable LSI-11 Autoboot

When the QFS10 is attached to an LSI-11 host, it is possible for the QFS10 to initiate the boot sequence. Four conditions are needed to accomplish this.

1. Autoboot must be enabled.

   ```
   Enable LSI-11 autoboot [Y/N (N)] Y <CR>
   ```

2. The autoboot jumper JP5 must be installed on the QFS10.

3. The autoboot controller address must be set.

   ```
   Autoboot controller address: [0-177777 (172150)]
   ```

4. The autoboot unit number must be set.

   ```
   Autoboot unit number: [0-255 (0)]
   ```

5.2.1.10 Autoboot Controller Address

Selects the CSR to autoboot from.

5.2.1.11 Autoboot Unit Number

The automatic bootstrapping option causes the system to boot automatically from the selected logical unit (0 through 7) on power-up. This option cannot be used with a MicroVAX or in a system that uses an 11/73B CPU module.

The automatic bootstrapping process requires that the LSI-11 CPU module be configured for power-up mode 0. The following table lists the configuration settings for several popular LSI-11 CPUs.

Processor	Autoboot Jumper Setting
11/73A	Install W3 and W7
11/23 +	Remove J18-19 and J18-J17
11/23	Remove W5 and W6
11/02	Remove W5 and W6

If you are using automatic bootstrapping, the controller will wait indefinitely for the boot device to come online and ready.

5.2.1.12 Enable Disk Data Caching

The QFS10 contains 512 Kbytes to 4 Mbytes, depending on the model, of cache memory. Depending on the application program that is running the QFS10, cache can significantly improve disk performance. Emulex recommends caching always be enabled:

```
Enable disk data caching: [Y/N (Y)]
```

CAUTION! When running multiple hosts that access the same area on a SCSI device the cache must be disabled. This is because the cache on the first host will not be updated when a write is executed by the second host to the SCSI device.

5.2.1.13 Minimum/Maximum Read Ahead Block Count

The QFS10 will continue reading the disk after the last logical block requested. The minimum read ahead block count default is 2.

```
Minimum read ahead block count: [0-64 (2)]
```

The maximum number of blocks to read ahead is set in the next NOVRAM field. It's default value is 16.

```
Maximum read ahead block count: [0-64 (16)]
```

Data caching, read ahead minimum and read ahead maximum block counts will require adjustments depending on your specific application.

5.2.1.14 Enable Host Initiated Replace

The last prompt asks if you want to enable host initiated bad block replacement for all drives connected to the QFS10. The default is `N`:

```
Host initiated replace: [Y/N (N)]
```

After responding to this prompt, a configuration summary is displayed with a prompt asking for any additional changes:

```
Disk controller address:          172150
Tape controller address:          174500
Changer device address:           160334
Utility server address:           160340
Disk base unit number:            0
Tape base unit number:            0
Changer device unit number:       255
Utility server unit number:       255
Enable Q-bus adaptive DMA:        YES
Q-bus DMA burst length:           8
Q-bus DMA burst delay:            2
Enable LSI-11 autoboot:           NO
Autoboot controller address:      172150
Autoboot unit number:             0
Enable disk data caching:         YES
Minimum read ahead block count:   2
Maximum read ahead block count:   16
Enable host initiated replace:    NO

Do you wish to change any parameters? [Y/N (N)]
```

To make further changes, enter `Y` and repeat the configuration steps. If everything is correct then press <CR> to proceed with device configuration.

5.2.2 SCSI Device Configuration

After you accept the QFS10 configuration, you are shown the current device configuration as follows:

NOTE: With Exabyte subsystems autoconfigure *must* be disabled before the operating system will boot.

```
Configuring devices, please wait

Enable SCSI autoconfigure:   YES
QFS10 SCSI ID:               7

Device Device CSR     SCSI SCSI Device       Device Identification
Number Type   Address ID   LUN  Options      Vendor    Product       Rev
1      Disk   172150  0    0    CA           IMPERIAL  MEAGRAM-SCSI  B

Options:    RM removable media          FS  tape fast file search
            HR host initiated replace   CA  data caching
            CD device is a CD ROM

SCSI auto-configure must be disabled to change device options

Do you wish to change any parameters?   [Y/N (N)]
```

If autoconfigure is enabled as in this example, the QFS10 uses SCSI test unit ready, inquiry and other commands to determine the address and other pertinent information about each attached device.

NOTE: If there are duplicate SCSI ID's on the SCSI bus, the FRU may display unreliable SCSI ID information.

If you wish to change any parameters, enter `Y` at the prompt. You are then asked if you want to enable autoconfigure:

```
    Enable SCSI autoconfigure: [Y/N (Y)]
```

Enter `N` if you wish to configure specific devices individually. The next prompt asks if you want to change the QFS10 SCSI ID. The default value is 7:

```
    QFS10 SCSI ID: [0-7 (7)]
```

Press <CR> to accept the default. You are then prompted as follows:

```
    Edit device configuration (1-Add 2-Delete 3-Modify): [1-3]
```

You may then add a device that was connected after running autoconfigure, delete a currently configured device, or modify a device configuration.

5.2.2.1 Add Device Configuration

To add a device, enter 1 and supply the requested information. For example:

```
Enter device type (0-Disk 1-Tape 2-Changer) [0-2 (0)]

Disk CSR addresses:  172150   160334   160340   160344   160350
Enter CSR address: [0-177777 (172150)]

Enter SCSI ID: [0-7 (0)]
```

The CSR address is typically the same CSR as previously entered in the NOVRAM.

Each device must have a unique SCSI ID. When prompted for the SCSI Logical Unit Number (LUN), you enter 0 unless you are connecting multiple devices through a multi-LUN controller with a single SCSI ID.

The next prompt asks if you are using removable media, i.e. a cartridge disk. The default is No.

```
    Removable media? [Y/N (N)]
```

The next prompt asks if you are using a CD ROM device. The default is No.

```
    Is device a CD ROM? [Y/N (N)]
```

If the disk device is a CD ROM, the following "Host Replace" prompt will not be displayed.

You are then asked if you want host initiated bad block replacement. If you accept the default (N), the QFS10 will transparently handle bad block replacement for the selected drive:

```
    Host initiated replace? [Y/N (N)]
```

The last prompt asks if you want the newly added device to be cached on the QFS10. The default is Yes:

```
    Enable disk data caching? [Y/N (Y)]
```

After answering the last prompt, a revised summary is displayed:

```
Enable SCSI auto-configure:  NO
QFS10 SCSI ID:               7

Device   Device  CSR      SCSI  SCSI  Device  Device Identification
Number   Type    Address  ID    LUN   Options Vendor   Product          Rev
1        Disk    172150   0     0     CA      IMPERIAL MEAGRAM-SCSI     B
2        Disk    172150   0     0     CA

Options:    RM removable media          FS  tape fast file search
            HR host initiated replace   CA  data caching
            CD device is a CD ROM

Do you wish to change any parameters?  [Y/N (N)]
```

Press <CR> to accept the configuration or N to select another option.

5.2.2.2 Modify Configuration

In the previous example both CSRs have the same SCSI ID and LUN. To correct this situation, select option 3 and enter the correct values. For example:

```
Do you wish to change any parameters?   [Y/N (N)] y <CR>
Enable SCSI auto-configure:  [Y/N (N)]
QFS10  SCSI ID:              [0-7 (7)]
Edit device configuration (1-Add 2-Delete 3-Modify):[1-3] 3<CR>

Enter device number to modify: [1-2] 2
Enter device type (0-Disk 1-Tape 2-Changer): [0-2 (0)]
Disk CSR addresses:   172150  160334  160340  160344  160350
Enter CSR address: [0-177777 (172150)]
Enter SCSI ID: [0-7 (0)] 1
Enter SCSI LUN: [0-7 (0)] 2
Removable media? [Y/N (N)]
Is device a CD ROM? [Y/N (N)]
Host initiated replace? [Y/N (N)]
Enable disk data caching? [Y/N (Y)]

Enable SCSI auto-configure:  NO
QFS10 SCSI ID:             7

Device Device CSR      SCSI  SCSI Device    Device Identification
Number Type   Address  ID    LUN  Options   Vendor   Product      Rev
1      Disk   172150   0     0    CA        IMPERIAL MEAGRAM-SCSI B
2      Disk   172150   1     2    CA

Options:    RM removable media          FS  tape fast file search
            HR host initiated replace   CA  data caching
            CD device is a CD ROM

Do you wish to change any parameters?  [Y/N (N)]
```

5.2.2.3 Delete Device

To delete a device from the configuration table, select option 2, Delete. For example:

```
    Do you wish to change any parameters?   [Y/N (N)] Y
    Enable SCSI auto-configure:  [Y/N (N)]
    QFS10  SCSI ID:              [0-7 (7)]
```

```
Edit device configuration (1-Add 2-Delete 3-Modify):[1-3] 2<CR>
```

At the prompt, enter the device you wish to delete. For example:

```
    Enter device number to delete:  [1-2] 2<CR>
```

After the deletion takes place, a new summary menu will be displayed showing the final results of our changes.

```
Device Device CSR      SCSI  SCSI Device    Device Identification
Number Type   Address  ID    LUN  Options   Vendor   Product      Rev
1      Disk   172150   0     0    CA        IMPERIAL MEAGRAM-SCSI  B

Options:    RM removable media          FS  tape fast file search
            HR host initiated replace   CA  data caching
            CD device is a CD ROM

Do you wish to change any parameters?  [Y/N (N)]
```

5.2.2.4 Save Configuration

When you are satisfied with the configuration, press <CR> at the prompt. Confirm your selection as follows:

```
Do you wish to save changes and reinitialize controller? [Y/N (N)]
```

If you press N, you are returned to the main menu and none of your inputs will be saved in NOVRAM. If you enter Y, the controller will reinitialize and the NOVRAM will be updated. If you are connected to the QFS10 local RS-232 port, the self-test sequence will be displayed.

The following line indicates the tests are complete as indicated by the message:

```
    SCSI initialization
    Scheduler started
```

Press <CR> to return to the main menu.

NOTE: If you are running in console mode, the FRU connection needs to be reestablished, see subsection on starting FRU.

5.3 Disk Utilities

When you select the Disk Utilities, the following menu appears:

```
    QFS10 Firmware Resident Utilities

            Disk Utilities Menu


            Return to Main Menu

            Performance Monitor

            Format Utility

            Verify Utility

            Exerciser Utility

            Erase Utility

            Replace Block Utility

    Up/Down arrow keys to move cursor
    <Return> to select option
```

NOTE: If the drive is a CD ROM drive, you will be prompted that the device is "Write Protected". This applies to any utility that tries to write to the CD media.

5.3.1 Performance Monitor

The disk performance monitor is not implemented at this time.

5.3.2 Format Utility

Disk format allows the user to do a low level (SCSI) format of the disk. The formatter allows the selective use of the grown defect list and an optional verify pass. A volume serial number can be selected also. After the format and block replacement has occurred, the factory caching table (FCT) will be initialized. Then, if verify was selected, a four pattern write/read–verify pass will occur.

CAUTION! All data will be lost during the formatting of a disk – BE CAREFUL!

The following is an example of the complete format and verification of a RAM disk.

```
QFS10 FORMAT Utility

Device Device CSR     Unit   SCSI SCSI Device  Device    Identification
Number Type   Address Number ID   LUN  Options Vendor     Product
1      Disk   160334  0      0    0    CA      IMPERIAL   MEAGRAM-SCSI

Devices selected:
    DISK Device 1
```

```
USER DATA WILL BE DESTROYED
Do you wish to continue? [Y/N (N)] Y <CR>
Format with grown defect list? [Y/N (Y)] Y <CR>
Verify disk after formatting? [Y/N (N)] Y <CR>

Initializing disk device 1
Enter volume serial number: [0-999999999 (0)] 999

Formatting disk device 1
Starting format
Format complete
Starting FCT initialization
FCT initialization complete
Starting verify
Reading
Writing pattern
Reading pattern
Writing pattern
Reading pattern
Writing pattern
Reading pattern
Writing pattern
Reading pattern
Verify complete
Type <Return> to continue
```

5.3.3 Verify Utility

You may choose write/read verification or read only verification. Any disk block containing a media defect is reassigned during verification. Verify displays all the configured disks in the system, as shown below; and you are prompted to select a specific disk by entering its device number.

After selecting a disk, Verify continues to prompt for another disk until you press <CR> only. When only one device is configured, Verify automatically selects and displays it. Note that Verify displays the unit numbers of the selected devices.

If you answer Y to enable writing on the media, Verify will perform four read/write passes over the disk, and user data will be destroyed.

```
Enable writing on media? [Y/N (N)]
*** USER DATA WILL BE DESTROYED! ***
Do you wish to continue? [Y/N (N)]
```

For nondestructive verification, disable writing on media, and Verify reads the disk once.

The following is an example of the verification of a RAM disk:

```
QFS10 VERIFY Utility

Device Device CSR      Unit   SCSI SCSI Device   Device   Identification
Number Type   Address  Number ID   LUN  Options  Vendor     Product
1      Disk   160334   0      0    0    CA       IMPERIAL   MEAGRAM-SCSI

Devices selected:
    DISK Device 1
```

```
Enable writing on media? [Y/N (N)] Y <CR>
 USER DATA WILL BE DESTROYED
Do you wish to continue? [Y/N (N)] Y <CR>

Verifying disk device 1
Starting verify
Reading
Writing pattern
Reading pattern
Writing pattern
Reading pattern
Writing pattern
Reading pattern
Writing pattern
Reading pattern
Verify complete
Type <Return> to continue
```

5.3.4 Exerciser Utility

The Exerciser Utility performs random reads and writes to the disk. Two modes of operation are offered. The first mode uses the diagnostic area of the drive only. This selection does not affect the normal user data area of the disk. If the diagnostic area is not selected, the test runs over the entire user area of the disk destroying any user data present. The default setting is for the diagnostic area to be tested. The second parameter is the pass count.

The following is an example of the Exerciser Utility menu:

```
QFS10 DRVEXR Diagnostic

Device Device CSR     Unit   SCSI SCSI Device  Device    Identification
Number Type   Address Number ID   LUN  Options Vendor      Product
1      Disk   160334  0      0    0    CA      IMPERIAL    MEAGRAM-SCSI

Devices selected:
 DISK Device 1

Write to diagnostic area only? [Y/N (Y)] Y <CR>
Enter test pass count: [1-999999999 (1)] <CR>

Starting pass 1
Starting test
Test complete
Type <Return> to continue
```

5.3.5 Erase Utility

The Erase Utility fully erases any existing data on the disk. This is accomplished by writing a number of special patterns to all logical blocks on the disk. The only option available with this utility is to abort prior to starting the erase operation.

The following is an example of the Erase Utility menu.

```
QFS10 ERASE Utility
```

```
Device Device CSR     Unit   SCSI SCSI Device  Device   Identification
Number Type   Address Number ID   LUN  Options Vendor     Product
1      Disk   160334  0      0    0    CA      IMPERIAL   MEAGRAM-SCSI

Devices selected:
 DISK Device 1

 USER DATA WILL BE DESTROYED
Do you wish to continue? [Y/N (N)] Y

Erasing disk device 1
Starting erase
Erase complete
Type <Return> to continue
```

5.3.6 Replace Block Utility

The Replace Block utility allows you to manually replace defective blocks (sectors) on the disk. It first does an inquiry of the disk to determine the replaceable block range. To exit this menu press <CR>.

The following is an example of the Replace Block Utility menu.

```
QFS10 REPLACE Utility

Device Device CSR     Unit   SCSI SCSI Device  Device   Identification
Number Type   Address Number ID   LUN  Options Vendor     Product
1      Disk   160334  0      0    0    CA      IMPERIAL   MEAGRAM-SCSI

Device Selected:
 Disk Device 1

Enter block number (decimal) to replace: [0-62916] 100
 Reassigning block 100
Enter block number (decimal) to replace: [0-62916] 62000
 Reassigning block 62000
Enter block number (decimal) to replace: [0-62916] <CR> to
exit.
```

5.4 Tape Utilities

When you select the Tape Utilities, the following menu appears:

```
QFS10 Firmware Resident Utilities

    Tape Utilities Menu


    Return to Main Menu

    Tape Monitor

    Exerciser Utility

    Erase Utility

Up/Down arrow keys to move cursor
<Return> to select option
```

5.4.1 Tape Monitor

The tape monitor allows the user to dynamically monitor the status and performance of tape devices attached to the QFS10. For each tape drive attached, there is a column on the monitor display. Up to four tape drives can be displayed on the screen at once. Press <CR> to display the remaining tapes attached if there are more than four.

The following is an example of the tape monitor display.

NOTE: This example shows an idle tape drive.

```
                      QFS10 Firmware Resident Utilities

                             Tape Monitor Utility

SCSI ID, SCSI LUN          3, 0

Device                     Python 25501

Current Command            Idle

Remaining Tape (kb)        0

Write Retry (%)            0.00

Read Ecc (%)               0.00

Data Transferred (kb)      0

Compression Ratio          0.00

Transfer Rate (kb/s)       0

                             Press CTRL C to return
```

5.4.2 Tape Exerciser Utility

The Tape Exerciser Utility performs read, write, verify, and spacing tests. Six data patterns are used. Each pattern is written/verified on the tape for 100 blocks. A pass count parameter is also included to run long term tests. Multiple drives may be tested simultaneously.

The following is an example of the tape exerciser display:

```
QFS10 DRVEXR Diagnostic

Device Device CSR     Unit   SCSI SCSI Device  Device    Identification
Number Type   Address Number ID   LUN  Options Vendor   Product
1      Tape   174500  0      3    0    CA      Archive  Python

Devices Selected:
 Tape Device 1

Enable writing on media? [Y/N (N) Y <CR>
 USER DATA WILL BE DESTROYED
Do you wish to continue? [Y/N (N)] <CR>
Enter test pass count: [1-999999999 (1)] 1 <CR>

Starting pass 1
Starting tape test
End of tape test
Type <Return> to continue
```

5.4.3 Erase Utility

The Erase Utility allows the user to send a SCSI erase command to the selected tape drive. After the erase is finished the display reverts to the tape utilities menu. Multiple drives may be selected to be erased.

The following is an example of the erase utility display:

```
Device Device CSR     Unit   SCSI SCSI Device  Device    Identification
Number Type   Address Number ID   LUN  Options Vendor   Product
1      Tape   174500  0      3    0    CA      Archive  Python

Devices Selected:
 Tape Device 1

USER DATA WILL BE DESTROYED
Do you wish to continue? [Y/N (N)] Y <CR>

Starting erase
Erase complete
Type <Return> to continue
```

5.5 Interactive SCSI Exerciser

The QFS10 Interactive SCSI Exerciser (ISE) allows you to set up and execute SCSI command packets or command descriptor blocks (CDBs). The screen displays all packets, their links and status of last operation, a buffer window, and the status of some options.

CAUTION! ISE is a low-level tool designed to be used only by experienced SCSI engineers.

The ISE requires at least one SCSI device configured on the bus. After selecting Interactive SCSI Exerciser from the main menu, a display shows the devices currently configured in the QFS10. The next prompt asks you to select a device:

NOTE: ISE can only work with one device selected at a time. ISE then displays its prompt ISE>. Enter `H` to display the help screen shown below:

```
QFS10 Interactive SCSI Exerciser

Device Device CSR     Unit   SCSI SCSI Device  Device    Identification
Number Type   Address Number ID   LUN  Options Vendor      Product
1      Disk   160334  0      0    0    CA      IMPERIAL  MEAGRAM-SCSI

Device Selected:
 Disk Device 1

ISE>h
B [n [off] ]                  display data buffer
B n off val...[/(R/I/D)]      modify data buffer
E                             exit ISE
G [n]                         execute packet
H                             display help information
P                             display command packets
P n off val...                modify command packet
Q                             exit ISE
R                             reset SCSI bus
U                             select device
ISE>
```

Enter E to exit the exerciser and return to the main menu.

A complete description of ISE is presented in the Emulex *Interactive SCSI Exerciser Users Guide*.

Appendix A
SCSI INTERFACE

A.1 Overview

This appendix describes the single-ended SCSI interface of the QFS10. SCSI is a standard interface established to support mass storage, printer output, and network communication for microcomputers and minicomputers. The QFS10 supports a maximum of seven intelligent peripherals connected to the SCSI bus.

When two devices communicate on the SCSI bus, one acts as the Initiator and the other acts as the Target. The Initiator (QFS10) originates an operation. The Target (the SCSI peripheral) performs the operation.

Some SCSI bus functions are assigned to the Initiator and some functions are assigned to the Target. The Initiator can arbitrate for control of the SCSI bus and select a specific Target. The Target can request the transfer of command, data, status, other information through the SCSI bus, or DISCONNECT from the Initiator. In some circumstances, the Target can arbitrate for control of the SCSI bus to reselect an Initiator and continue an operation.

SCSI bus data transfer operations can be asynchronous or synchronous. They follow a request/acknowledge (REQ/ACK) handshake protocol, which is defined in the ANSI SCSI specification. The SCSI bus consists of 18 signal lines: nine for an 8-bit data bus with parity, and nine for control and status signals that coordinate data transfer operations between the host adapter and SCSI controllers.

The SCSI Interface includes the following features:

- FAST SCSI (up to 10 Mbytes/second) is supported.
- Both asynchronous and synchronous devices are supported.
- Disk, tape, optical, magneto optical, and robotic peripherals are supported. See subsection 1.6.1.
- SCSI devices are daisy-chained with both ends of the bus terminated.
- All signals are common among all SCSI devices.
- The QFS10 supports the ANSI SCSI specification single-ended option for drivers and receivers.
- The maximum cable length allowed is 19.6 feet (6 meters).

The QFS10 interfaces to a SCSI peripheral through the SCSI bus. A 50-pin male connector plugs directly into the SCSI bus. Various transition adapter cables and panels are available to connect to other style connectors. All SCSI signals use open drain drivers on the QFS10.

A.2 Output Signal Characteristics

When measured at the SCSI device's connection, each signal driven by a SCSI device has the following output characteristics:

- Signal assertion = 0.0 to 0.4 VDC
- Minimum driver output capability = 48 milliamps (sinking) at 0.5 VDC
- Signal negation = 2.5 to 5.25 VDC

All SCSI signals used by the QFS10 are terminated with an active terminator as described in the SCSI-2 specification. The terminator can be turned on or off via JP1.

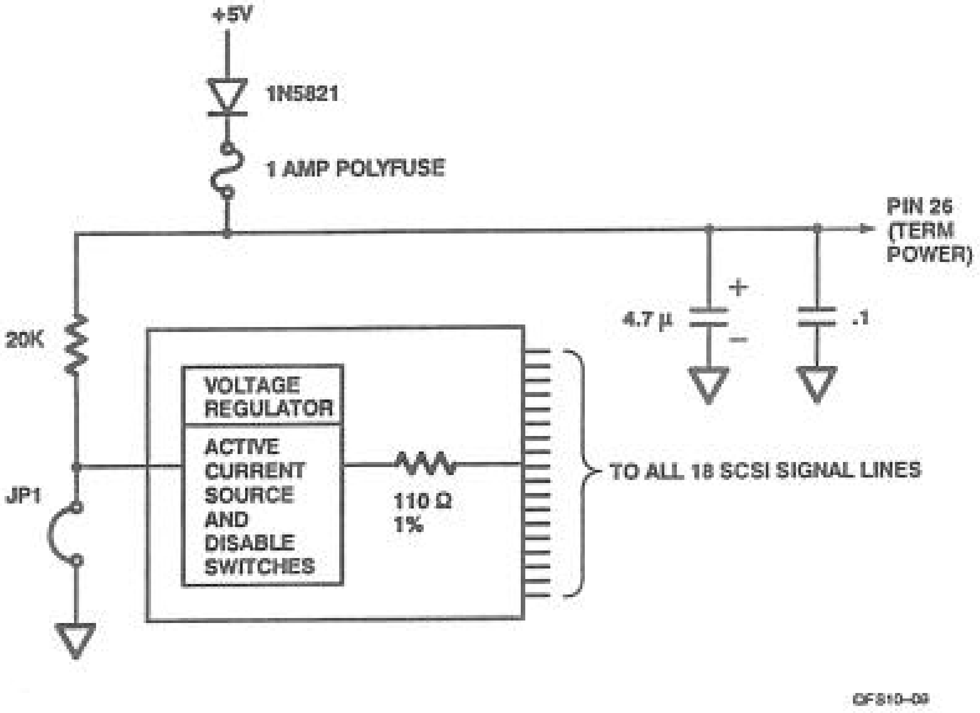

Figure A–1. SCSI Bus Signals Termination

A.3 Input Signal Characteristics

When measured at the SCSI device's connection, each signal has the following input characteristics:

- Signal true –0.0 to 0.8 VDC
- Maximum total input load = –0.4 milliamps to 0.4 VDC
- Signal false = 2.0 to 5.25 VDC
- Minimum input hysteresis = 0.2 VDC

A.4 Termination Power

The QFS10 supports the single-ended SCSI option, which provides pin 26 with termination power, including the following characteristics:

Vcc = 4.25 to 5.25 VDC (through diode) 1-Amp maximum source drive capability

A.5 SCSI Bus Signals and Connector

SCSI bus activities involve one or more of the following operation phases:

- Arbitration Phase
- Selection Phase
- Reselection Phase
- Command Phase
- Data Phase
- Status Phase
- Message Phase

These phases are described in the *Emulex SCSI Disk Controller Programming Reference Manual* (Emulex P/N MD2352501–00). When the SCSI bus is not involved in one of the above phases, it is in the Bus Free Phase. SCSI phase sequencing is accomplished by asserting or deasserting the SCSI bus signals. There are 18 signals on the SCSI bus. Nine of them are control signals that coordinate data transfer between SCSI bus host adapters and controllers; the other nine are for an 8–bit data bus with parity.

The SCSI bus connector mating to the QFS10 must be compatible with the 3M 3596 connector. Figure A–2 shows its pin and signal assignments.

GROUND	1	2	-DATA (0)
GROUND	3	4	-DATA (1)
GROUND	5	6	-DATA (2)
GROUND	7	8	-DATA (3)
GROUND	9	10	-DATA (4)
GROUND	11	12	-DATA (5)
GROUND	13	14	-DATA (6)
GROUND	15	16	-DATA (7)
GROUND	17	18	-DATA (P)
GROUND	19	20	GROUND
GROUND	21	22	GROUND
GROUND	23	24	GROUND
N/C	25	26	TERMPWR
GROUND	27	28	GROUND
GROUND	29	30	GROUND
GROUND	31	32	-ATN
GROUND	33	34	GROUND
GROUND	35	36	-BSY
GROUND	37	38	-ACK
GROUND	39	40	-RST
GROUND	41	42	MSG
GROUND	43	44	-SEL
GROUND	45	46	-C/D
GROUND	47	48	-REQ
GROUND	49	50	-I/O

MD30-05

Figure A–2. Pin and Signal Assignments of the SCSI Connector (J1)

Appendix B
PROM REMOVAL AND REPLACEMENT

B.1 Overview

This appendix provides instructions for replacing the firmware PROM on the host adapter.

B.2 Exchanging PROMs

The host adapter firmware PROM is located in the socket at U28. Remove the existing PROM from its socket using a special IC puller designed for PLCC devices. The AMP P/N 821591–1 or equivalent is the recommended tool. Place the two teeth of the tool into the extraction holes at two of the corners of the top of the socket. Push the tool fully into the socket, apply steady pressure on the handles, and extract the EPROM. The socket is keyed to match the corners of the EPROM. Align the new EPROM with the socket, and apply steady pressure with your thumb until the EPROM is firmly seated.

CAUTION! The PROM is an electrostatic sensitive device. Be sure to observe proper antistatic protection procedures and wear a grounded wrist strap when inserting or removing the PROM.

Refer to Figure B–1 for proper pin 1 orientation when inserting the replacement PROM in socket U28. Make certain that the PROM is firmly seated and that no pins are bent or misaligned.

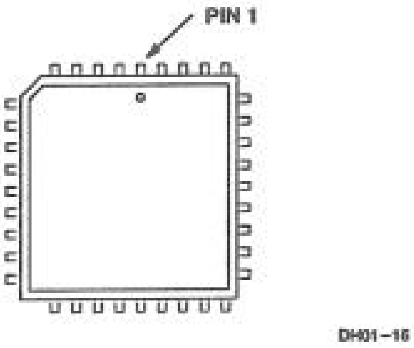

Figure B–1. Prom Installation

SCSI Small Computer Systems Interface. A standard interface and protocol for connecting devices such as disk and tape drives to one on more hosts on a common bus.

SCSI-2 An advanced implementation of the SCSI standard.

Single Port Configuration A subsystem configuration in which a single host adapter is connected to a SCSI bus. In this configuration, up to 7 devices may be connected to the bus.

Target Any device on the SCSI bus that receives a SCSI command and performs the requested action. See *Initiator.*

Transition Panel Provides a method for connecting a 50-pin card-edge connector to a SCSI high density Honda connector and provides FCC shielding for MicroVax II.

INDEX

A

Active termination, enabling via jumper, 3−9

Add SCSI device, 5−10

Autoboot, configuring for LSI-11, 5−6

C

Cabling
  for LSI-11/MicroVAX II hosts, 3−14
  for MicroVAX III hosts, 3−12
  FRU port, 4−10

Cache, determining size, 1−4

Cartridge tape
  performance, 2−4
  selecting data compression, 2−4

Checklist, installing the QFS-10, 3−2

Commands supported
  MSCP, 1−13
  SCSI, 1−15
  TMSCP, 1−14

Compatibility
  host system, 1−8
  software, 1−9

Configuration
  change device unit number, 5−4
  disk base unit number, 5−4
  for SCSI devices, 5−9
  multi-host, 1−6
  read-ahead count, 5−8
  reporting form, 3−4
  single host, 1−6

Configuration utility, 5−3

Configurations, initiator and targets, 2−2

Configuring DMA, 5−5

D

Data compression, enabling on a cartridge drive, 2−4

Delete SCSI device, 5−11

Density, switch for data compression, 2−4

Design features, 1−2

Disk, performance, 2−4

Disk cache, enabling, 5−7

Disk exerciser, 5−15

Disk utilities
  erase, 5−15
  exerciser, 5−15
  format, 5−13
  performance monitor, 5−13
  replace block, 5−16
  verify, 5−14

DMA, 1−2
  selecting adaptive or block, 5−5
  setting delay and burst length, 5−6

Documentation, xiv

E

Electrical specifications, 1−11

Erase tape, 5−18

F

FCC compliance, 3−1

Features summary, 1−2

Formatting, using disk utilities, 5−13

FRU
  control keys, 4−2
  keyboard conventions, 5−1
  modes of operation, 4−2
  RS-232 port, 4−10
  running from application, 4−11
  SCSI exerciser, 5−19
  selecting terminal type, 5−2
  starting in online mode, 4−10
  tape utilities, 5−17
  terminating offline operation, 4−9
  terminating online mode, 4−11

G

GPX terminals, running FRU, 5−2

H

Host-initiated replace, enabling in configuration, 5−8

I

Installation
  MicroVAX II/LSI-11, 3–13
  MicroVAX II/VAX 4000, 3–10

IRQ, setting via jumper, 3–8

J

Jumpers
  active termination, 3–9
  setting IRQ, 3–8
  summary, 3–6

L

LEDs, reading error codes, 3–16

LSI-11
  MSCP offsets, 4–7
  Starting FRU normally, 4–7
  Starting FRU with Address conflict, 4–9
  TMSCP offsets, 4–8

LSI-11 supported, 1–1

M

Manual organization, xiii

MicroVAX
  MSCP offsets, 4–4
  Starting FRU normally, 4–3
  Starting FRU with address conflict, 4–6
  TMSCP offsets, 4–5

Modify SCSI configuration, 5–11

MSCP, commands supported, 1–13

MSCP offsets
  LSI-11, 4–7
  MicroVAX II, 4–4

O

Ordering information, xiv

Output signals, SCSI, A–2

P

Performance
  disk and tape, 2–4
  monitoring for disk, 5–13
  tape, 5–17

Physical layout, 3–5

Physical overview, 1–6

Power requirements, 1–11

Product description, 1–1

Product support, xiv

PROM, changing for upgrade, B–1

R

Read-ahead block count, 5–8

Related documents, xiv

Replace disk block, 5–16

S

SCSI
  Active termination, A–2
  bus termination, 3–15
  bus termination power, A–3
  disk and tape commands, 1–15
  Disk formatting, 1–9
  Disk reformatting required, 2–1
  input signals, A–3
  interactive exerciser, 5–19
  output characteristics, A–2
  overview of interface, A–1

SCSI cabling
  to QFS-10, 3–14
  to QFS-10/M, 3–12

Selecting host processor, 3–7

Self-test
  enabling, 3–8
  error codes, 3–16
  fatal errors, 3–17

Specifications, 1–11
  CPU interface, 1–12

Starting FRU, offline mode
  routine on LSI-11 hosts, 4–7
  routine on MicroVAX hosts, 4–3

Support, for MSCP and TMSCP, 1–1

Switch settings, summary, 3–6

Switches
  FRU upload, 3–7
  processor selection, 3–7
  reset/halt, 3–7
  self-test, 3–8

T

Tape exerciser, 5–18

Tape monitor, 1–3

Tape utilities
  erase, 5–18
  performance monitor, 5–17
  tape exerciser, 5–18

Technical support, xiv

Terminal type, selecting for FRU, 5–2

Termination, SCSI bus, 3–15

Termination power, SCSI bus, A–3

TMSCP, commands supported, 1–14

TMSCP offsets
  LSI-11, 4–8
  MicroVAX/VAX, 4–5

Transition panel, installing in LSI-11 hosts, 3–14

Typographical conventions, xiv

U

Unpacking instructions, 3–3

Upgrade, changing PROM, B–1

Upload FRU switch, 3–7